

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT _____

FEDERAL PROJECT _____

FOR

SECTION 618

DELETE THE CONTENTS AND HEADING AND REPLACE WITH THE FOLLOWING:

SECTION 618

THREE-SIDED REINFORCED CONCRETE CULVERT

618.1 - DESCRIPTION:

This work shall consist of furnishing the design, construction plans, materials, and construction of single piece precast or cast-in-place reinforced concrete three-sided flat-topped culverts or single piece precast reinforced concrete three-sided arch-topped culverts or a two-piece precast reinforced concrete three-sided continuous arch culvert, with headwalls and wingwalls, in accordance with these specifications and in reasonably close conformity with the lines, grades, design, and dimensions shown in the plans.

618.2 - GENERAL:

The type of three-sided culvert may be, at the Contractor's option, any one of the culvert systems on the approved vendor list corresponding to the pay item listed in the contract documents. The approved System List is available through the Materials Control Soils and Testing Division.

The Contractor shall indicate which culvert system is to be constructed by the bid alternative chosen in the proposal. No change of the culvert system indicated in the bid proposal shall be permitted after the bid opening unless approved by the Engineer.

The culvert design and detail plans for construction shall be submitted to the Engineer for approval. The time required for preparation and review of these submittals shall be charged to the allowable contract time. Delays caused by untimely submittals or insufficient data will not be considered justification for time extensions. No additional compensation will be made for any additional material, equipment, or other items found necessary to comply with the project specifications as a result of the Engineer's review.

The proposed culvert design shall be compatible with the Contractor's proposed method of construction, and shall be compatible with any method of construction shown in the plans. The Division does not assume nor warrant any culvert system's compatibility with any particular construction methods.

618.3 - DESIGN CRITERIA:

618.3.1 - General: The following data will be provided on the contract plans:

- a. maximum allowable headwater elevation,
- b. maximum allowable velocity through the culvert,
- c. the tailwater depth used for design,
- d. minimum required open-end area,
- e. bearing capacity to be used for the design of the foundation, at the required location,
- f. design year ADT,
- g. design year percent trucks,
- h. roadway profile and elevation
- i. For tunnels or underpass structures the division will provide the required clearance box in addition to the bearing capacity and roadway profile.

The size of all structural elements shall be determined such that the design load stresses do not exceed the allowable stresses found in the AASHTO LRFD Bridge Design Specifications, latest edition.

If parapets are used on any portion of the headwalls and wingwalls as shown in the plans, they shall be designed to resist traffic loads in accordance with the AASHTO LRFD Bridge Design Specifications, latest edition. The load shall be a HL-93 (HS25) test level 3.

The length and height of the wingwalls and headwalls must be designed to accommodate the specified fill slope without fill encroaching on the underlying streambed, waterway or edge of roadway template. Wingwalls with a tapered bottom surface shall not be used due to compaction difficulties beneath the wingwall. Wingwall options other than cast-in-place shall only be systems that have been evaluated by HITEC.

Except those on roads with a design year ADT less than 500 and where the product of the design year percent trucks times the ADT is less than 100, all flat-topped structures with less than two feet of cover shall have approach slabs per the Divisions Structural Design Manual.

618.3.2 - Precast Three-Sided Culvert: The culvert dimension and reinforcement details shall be as prescribed in the plan and the shop drawings provided by the manufacturer. The minimum concrete compressive strength shall be 4,000 psi (28 MPa). The minimum steel yield strength shall be 60 ksi (414 MPa).

Unless noted otherwise on the shop drawings and designed accordingly, a minimum of one foot of cover above the crown of the culvert is required in the installed condition.

618.3.2.1-Placement of Reinforcement: The cover of concrete over the outside reinforcement shall be 2 inches (50mm) minimum. The cover of concrete over the inside reinforcement shall be 1 1/2 inches (37.5mm) minimum. The clear distance of the end shall not be less than one inch (25mm) nor more than two inches (50mm) from the ends of the culvert. Reinforcement shall be assembled utilizing single or multiple layers of welded wire fabric, or utilizing a single layer of deformed billet-steel bars. The welded wire fabric shall be composed of circumferential and longitudinal wires meeting the spacing requirements of 618.3.2.3 and shall contain sufficient longitudinal wires extending through the culvert to maintain the shape and position of the reinforcement. Longitudinal distribution reinforcement may be welded wire fabric or deformed billet-steel bars and shall meet the spacing requirements of 618.3.2.3. The ends of the longitudinal distribution reinforcement shall be not more than 3 inches (75mm) from the ends of the culvert.

618.3.2.2-Bending of Reinforcement: The outside and inside circumferential reinforcing steel for the corners of the culvert shall be bent to such an angle that is approximately equal to the configuration of the culvert's outside corner.

618.3.2.3-Laps, Welds, and Spacing: Tension splices in the circumferential reinforcement shall be made by lapping. Laps may be tack welded together for assembly purposes. For smooth welded wire fabric, the overlap shall meet the requirements of ACI 12.8 and 12.19. For deformed welded wire fabric, the overlap shall meet the requirements of ACI 12.7 and 12.18. For deformed billet-steel bars, the overlap shall meet the requirements of ACI 12.2. For splices other than tension splices, the overlap shall be a minimum of 12 inches (300mm) for welded wire fabric or deformed billet-steel bars. The spacing center-to-center of the circumferential wires in a wire fabric sheet shall be not less than 2 inches (50mm) nor more than 4 inches (100mm). For the wire fabric, the spacing center-to-center of the longitudinal wires shall not be more than 8 inches (200mm). The spacing center-to-center of the longitudinal distribution steel for either line of reinforcing in the top slab shall be not more than 16 inches (400mm).

618.3.3 – Cast-In-Place Three-Sided Culvert:

Cast-in-place structures shall be constructed per section 601.

618.4 - SUBMITTALS:

618.4.1-General: The Contractor shall submit complete design calculations, explanatory notes, and detail plans for the proposed culvert system. The detail plans shall include all details, dimensions, quantities, and cross sections necessary to construct the culvert and shall include but not be limited to the following items:

1. Hydraulic calculation, using Form DR-4 in the WVDOH Drainage Manual, Latest edition, to determine the headwater elevation and velocity of flow for the proposed culvert, plus all supporting hydrolic calculations on deparate sheets.
2. Structure span and rise.
3. Culvert section details showing all concrete dimensions and reinforcing steel requirements.
4. Design computations and details for pedestals, when required.
5. Footing details showing all concrete dimensions, elevations, and reinforcing steel with bar size, length, and spacing indicated. Footing plan and section views shall be provided. The soil bearing pressure used in the design shall be noted on the footing detail sheets.
6. Wingwall design computations and details showing all concrete dimensions, reinforcing steel and anchorage details. Wingwall plan, elevation, and section views shall be provided.
7. Headwall details, showing all concrete dimensions, reinforcing steel and anchorage details. Headwall elevation and section views shall be provided.
8. Structure backfill type and limits for culvert and wingwalls.
9. Lifting handling points shown on drawings.

At the time the detail plans are submitted for review, they shall be accompanied by design calculations and explanatory notes. These documents shall be legible and shall demonstrate that the design criteria have been met.

The plans shall be prepared on reproducible sheets 11 x 17 inches (280 mm x 432 mm) including borders. Each sheet shall have a title block in the lower right hand corner. The title block shall include the sheet number of the drawing, name or designation of the structural unit detailed on the sheet, the state and federal project designation, project name, fabricator and Contractor name. Design calculations and notes shall be prepared on sheets 8½ x 11 inches (216 mm x 280 mm), and shall contain the project designation, structural unit designation, date of preparation, initials of designer and checker, and page number at the top of the page. The Detail Plans, Design Calculations, and Explanatory Notes shall be signed and stamped by a Professional Engineer registered in West Virginia and knowledgeable in the proposed culvert system.

The initial submission shall include three sets of the detail plans, calculations, and notes. One set of notes and plans will be returned to the Contractor with any indicated corrections. When the plans and notes are stamped approved by the Engineer, the Contractor shall furnish the Engineer with the requested number of sets of prints and a Mylar set of the plans for distribution by the Division. The Contractor shall perform no work or ordering of materials for the structures until the Engineer has approved the submittal.

618.4.2 - Precast Three-Sided Culvert: The details and material specifications for the culvert system elements and incidental accessories shall be included with the detail plans for approval by the Engineer.

618.4.3 - Cast-in-Place Three Sided Culvert: The plans for the cast-in-place culvert shall contain a complete reinforcing bar schedule showing all bending details and bar marks. The plans shall also show the location of all construction joints, expansion joints, or other joints in the culvert.

618.5 - MATERIALS:

618.5.1 - Concrete: The concrete for the culverts shall be air-entrained composed of portland cement, fine and coarse aggregates, admixtures and water. Concrete shall contain 7 ± 2 percent air. The air entraining admixture shall conform to section 707.1.

618.5.1.1 - Portland Cement: Shall conform to the requirements of sections 701.1 and 701.3.

618.5.1.2 - Coarse Aggregate: Shall consist of stone having a maximum size of 1 inch (25mm). Aggregate shall meet the requirements of sections 703.1, 703.2 or 703.3.

618.5.1.3 - Water Reducing Admixture: The manufacturer may submit for approval by the Engineer, a water-reducing admixture, per section 707.3, for the purpose of increasing workability and reducing the water requirement for the concrete.

618.5.1.4 - Calcium Chloride: The addition to the mix of calcium chloride or admixtures containing calcium chloride will not be permitted.

618.5.1.5 - Fine Aggregates: Shall conform to section 702.1. Only siliceous sand shall be used when the top of the structure is to be the driving surface.

618.5.1.6 - Mixing Water: Shall conform to section 715.7.

618.5.1.7 - Water Reducers / Retarding Admixtures: Shall conform to section 707.2.

618.5.1.8 - Joint Material: Shall conform to Section 708.7.

618.5.1.9 – Pozzolanic Additives: Shall conform to Section 707.4.

618.5.2 - Reinforcing Steel: All reinforcing steel for the culverts shall be fabricated and placed in accordance with the detailed shop drawings submitted by the manufacturer.

Reinforcement shall be grade 60 or as specified in the plans, and shall comply with sections 709.1, 709.4 or 709.6. Longitudinal distribution reinforcement may consist of welded wire fabric or deformed billet-steel bars.

Steel reinforcing shall be epoxy coated per AASHTO M-284 or galvanized per AASHTO M-111 for structures installed at an elevation such that the top or crown of the structure is above the bottom of the subgrade in the pavement section.

618.5.3 – Permissible Variations:

618.5.3.1 - Internal Dimensions: The internal dimensions shall not vary from the design dimensions by more than 1 percent or 1 1/2 inches (37mm), whichever is less. The haunch dimensions shall vary not more than 3/4 inch (19mm) from the design dimension.

618.5.3.2 - Slab and Wall Thickness: The slab and wall thickness shall not be less than that shown in the design by more than 1/4 inch (6mm). A thickness more than that required in the design shall not be cause for rejection.

618.5.3.3 - Length of Opposite Surfaces: Variations in laying lengths of the two opposite surfaces of the culvert shall not be more than 5/8 inch (16mm) in any culvert section, except where beveled ends for laying of curves are specified by the purchaser.

618.5.3.4 - Length of Section: The underrun in length of a section shall not be more than 1/2 inch (13mm) in any culvert.

618.5.3.5 - Position of Reinforcement: The maximum variation in position of the reinforcement shall be + 1/2 inch (13mm). In no case shall the cover over the reinforcement be less than 1 1/2 inch (38mm) for the outside circumferential steel or be less than 1 inch (25mm) for the inside circumferential steel as measured to the external or internal surface of the culvert. These tolerances or cover requirements do not apply to mating surfaces of the joints.

618.5.3.6 - Area of Reinforcement: - The areas of steel reinforcement shall be the design steel areas as shown in the manufacturer's shop drawings. Steel areas greater than those required shall not be cause for rejection. The permissible variation in diameter of any reinforcement shall conform to the tolerances prescribed in the ASTM Specification for that type of reinforcement.

618.5.4 - Testing and Inspection:

618.5.4.1 - Precast Three-Sided Culverts:

618.5.4.1.1 - Type of Test Specimen: Concrete compressive strength shall be determined from compression tests made on cylinders or cores. For cylinder testing a minimum of 5 cylinders shall be taken during each production day. For core testing, one core shall be cut from a culvert section selected at random from each group of 15 culverts or less of a particular size and production run. For each continuous production run, each group of 15 culverts of a single size or fraction thereof shall be considered separately for the purpose of testing and

acceptance. A production run shall be considered continuous if not interrupted for more than 3 consecutive days.

618.5.4.1.2 - Compression Testing: Cylinders shall be made and tested as prescribed by the AASHTO T-22 Specification. Cores shall be obtained and tested for compressive strength in accordance with the provisions of the AASHTO T280 Specification.

618.5.4.1.3 - Acceptability of Cylinder Tests: Failure of any of the 28 day test cylinders to meet 90 percent of the minimum compressive strength requirement can be cause for rejection. The average of all cylinders must meet or exceed the design strength.

618.5.4.1.4 - Acceptability of Core Tests: - The compressive strength of the concrete in each group of culverts as defined in 618.5.4.1.1 is acceptable when the core test strength is equal to or greater than the design concrete strength. When the compressive strength of the core tested is less than the design concrete strength, the culvert from which that core was taken may be recored. When the compressive strength of the recore is equal to or greater than the design concrete strength, the compressive strength of the concrete in that group of culverts is acceptable.

When the compressive strength of any recore is less than the design concrete strength, the culvert from which that core was taken shall be rejected. Two culverts from the remainder of the group shall be selected at random and one core shall be taken from each. If the compressive strength of both cores is equal to or greater than the design concrete strength, the compressive strength of the remainder of that group of culverts is acceptable. If the compressive strength of either of the two cores tested is less than the design concrete strength, the remainder of the group of culverts shall be rejected or, at the option of the manufacturer, each culvert of the remainder of the group shall be cored and accepted individually, and any of these culverts that have cores with less than the design concrete strength shall be rejected.

Plugging Core Holes - The core holes shall be plugged and sealed by the manufacturer in a manner such that the culvert will meet all of the test requirements of this specification. Culverts so sealed shall be considered satisfactory for use.

Test Equipment - Every manufacturer furnishing culverts under this specification shall furnish all facilities and personnel necessary to carryout the test required.

618.5.4.2 – Cast-In-Place Three-Sided Culvert:

Cast-in-place testing and inspection shall be per section 601.

618.5.5 - Joints:

618.5.5.1 – Precast Three-Sided Arch-Topped Culverts: The culvert units shall be produced with flat butt ends. The ends of the culvert shall be such that when the sections are laid together they will make a continuous line of culverts with a smooth interior free of appreciable irregularities, all compatible with the permissible variations in 618.5.3. The joint width shall not exceed 3/4 inches (19mm). The outside edges of the ends of each culvert section shall be chamfered. The butt joint made by two adjoining culverts shall be covered with a piece of preformed bituminous joint sealant and a minimum of a nine inch wide joint wrap.

618.5.5.2 – Precast Three-Sided Flat-Topped Culverts: The culvert sections for flat-topped culverts shall be produced with a minimum 4 inches (100mm) deep by 1-1/2 inches (38mm) wide keyway joint. Shear key grout in accordance with Section 715.5 shall be placed in the keyway joint.

618.5.6 - Workmanship and Finish: The culverts shall be substantially free of fractures. The ends of the culverts shall be normal to the walls and centerline of the culvert section, within the limits of the variations given in 618.5.3, except where beveled ends are specified. The surface of the culverts shall be a smooth steel form or troweled surface.

618.5.7 - Repairs: All repairs are to be preformed in accordance with 603.10.2.

618.5.8 - Inspection: The quality of materials, the process of manufacture, and the finished culverts shall be subject to inspection by the engineer.

618.5.9 – Rejection: Culverts shall be subject to rejection on account of any of the specification requirements. Individual culverts may be rejected because of any of the following:

- a. Fractures or cracks passing through the wall, except for a single end crack that does not exceed one half the thickness of the wall.
- b. Defects that indicate proportioning, mixing, and molding not in compliance with Section 5.
- c. Honeycombed or open texture of surfaces greater than 6" x 6" (150mm x 150mm) whereby voids greater than 1/2" (13mm) diameter and over 1" (25mm) deep occur.
- d. Damaged joint mating surfaces where such damage prevents construction of a satisfactory joint. For butt type joints, damaged surfaces greater than 12" (300mm) long and over 2" (50mm) deep will be cause for rejection of the units. For shear key type joints, damages surfaces of the shear key greater than 12" (300mm) long and deeper than the shear key may be cause for rejection.

618.5.10 - Marking: Each culvert shall be clearly marked by waterproof paint. The following shall be shown on the inside of the vertical leg of the culvert section:

Culvert Section Span X Culvert Rise
Date of Manufacture
Name or trademark of the manufacturer
WV State and Federal Project Number
Project Contract Number

618.5.11: - Backfill: Backfill material shall be select material for backfilling in accordance with 626.5.3. Backfilling shall be according to 626.6.1.3. The backfill material is to be placed in a zone with a minimum width that extends to a point located 4 feet (1.2 meters) outside the base of each leg and with a height being equal to the outside height of the structure plus two feet or the minimum cover, whichever is less. This material is also to be placed to a depth of at least 4 feet (1.2 meters) behind each wingwall.

618.6 - CONSTRUCTION METHODS:

618.6.1 - Precast Three-Sided Culvert:

618.6.1.1 – Footings: The culverts shall be installed on cast-in-place concrete footings. The elevation of the bottom of the footing shall be equal to or lower than the elevation as shown on the plans. A keyway for grouting with a minimum depth of 3 inches (75mm) shall be formed in the top surface of the footing and the keyway shall extend to where 3 inches (75mm) clear of the inside and outside faces of the culvert, unless specified otherwise on the plans. The footings shall be given a rough float finish and shall reach a compressive strength of 2,000 psi (14 Mpa) before placement of the culvert sections. The completed footing surface shall be constructed in accordance with grades shown on the plans. When tested with a 10 foot (3 meter) straight edge, the top surface of the footings shall not vary more than 1/4 inch (6mm) in 10 feet (3 meters).

For three sided structures with curved legs at the footing to leg interface shall be placed on 2 inch (50mm) thick concrete leveling pads poured in the keyway. These leveling pads shall be wide enough to support at least 8 inches (200mm) of each end of the leg of every precast unit. The top of these pads shall be at least 3 inches (75mm) below the top of the footing, and must be within 1/8 inch (3mm) of the final grade. The leveling pads must cure for 72 hours before the arch units are placed.

The foundation is to be constructed in accordance with the approved shop drawings.

618.6.1.2 - Placement of the Culverts: A representative of the manufacturer shall be present during the entire time the structure is being placed. The culverts shall be placed as shown on the Engineer's plan drawings. Special care shall be

taken in setting the culverts to the true line and grade. The culverts shall be set on masonite or steel shims at least 5 inches (125mm) square, or on a concrete leveling pad cast inside the keyway. When set on shims a minimum of a 1/2 inch (13mm) gap shall be provided between the footing and the base of the culvert leg. Prior to grouting three sided structures with legs that have a curved exterior surface, the legs shall be supported horizontally using hardwood wedges driven between the outside of the structure leg and the wall of the keyway. Wedges shall be spaced no more than two feet (600mm) apart along both sides of the structure. A non-shrink grout per section 715.5 shall be used to fill the keyway on structures with legs that have a curved exterior surface. The keyway shall be filled with grout per section 708.8 or section 715.5 on structures with legs that have a vertical exterior surface.

618.6.1.3 - External Waterproofing: A waterproofing membrane as described below shall be applied to the top and the sides of the structure unless the top of the structure is to be the driving surface. The material should be installed per manufacturers instructions.

Property	Value ¹	Test Method
Strip Tensile	50 lbs./in. (8.7 kN/m)	ASTM D 882 ²
Puncture Resistance	200 lbs. (890 N)	ASTM E 154
Permeance	0.10 perms (max.)	ASTM E 96, Method B
Pliability	No cracks in fabric or rubberized asphalt	ASTM D 146 ³

¹ Minimum average roll values unless otherwise noted

² Using 12 in/min (300mm/min) test speed and 1" (25mm) initial distance between grips.

³ Using 180° bend on ¼ inch (6mm) mandrel at -25°F (-32°C)

The surface shall be free of dirt before applying the waterproofing material. A primer compatible with the waterproofing membrane to be used shall be applied before the membrane is installed. The structure should be covered continuously from the bottom of one culvert section leg, across the top of the structure and to the bottom of the opposite culvert section leg. The joint between the end unit and the headwall shall also be sealed by carrying the membrane up the headwall at least 4 inches (100mm). If precast wingwalls are used, the joint between the wingwall and the end units should be covered in a similar fashion, or, at the discretion of the engineer, filter fabric can be substituted.

618.6.1.4 – Backfill Placement: Backfill shall be considered as all replaced excavation and new embankment adjacent to the precast bridge units and wingwalls. The project construction and material specifications, which include

the specifications for excavation for structures and roadway excavation and embankment construction, shall apply except as modified in this section.

No backfill shall be placed against any structural elements until they have been approved by the Engineer. No backfill shall be placed against the structure until the grout has cured for a minimum of 12 hours. On three sided structures with legs that have a curved exterior surface the grout shall be cured for a minimum of 72 hours before placing backfill against the structure.

Backfill against the waterproofing membrane shall be placed carefully to avoid damage to the waterproofing material.

Mechanical tampers or approved compacting equipment shall be used to compact all backfill and embankment immediately adjacent to each side of the culvert and over the top of the culvert until it is covered to a minimum depth of one foot. The backfill within 4 feet (1.2 meters) of each side of the culvert shall be placed in lifts of 8 inches (200mm) or less (loose depth). Heavy compaction equipment shall not be operated in this area or over the culvert until it is covered to a depth of 1 foot (300mm).

Lightweight dozers and graders may be operated over culverts having 1 foot (300mm) of compacted cover, but heavy earth moving equipment (larger than a D-4 Dozer weighing in excess of 12 tons (11 Mg) and having track pressures of eight psi (55 kPa) or greater) shall require two feet (600mm) of cover unless the design cover is less than two feet (600mm). In no case shall equipment operating in excess of the design load be permitted over the culvert unless approved by the engineer.

Any additional fill and subsequent excavation required to provide this minimum cover shall be made at no additional cost to the project.

When placing backfill at no time shall the difference between the heights of fill on opposite sides of the culvert exceed 18" (450mm).

Backfill in front of wingwalls shall be carried to ground lines shown in the plans.

618.6.2 - Cast-in-Place Reinforced Concrete: Except as otherwise shown in the plans or herein, construction methods for cast-in-place three-sided structures shall comply with the Standard Specifications. A waterproofing membrane per section 618.6.1.3 shall be applied to the exterior top and the sides of the structure. Construction methods for the following shall be per the indicated section of the Standard Specifications:

Item	Section
Unclassified Borrow Excavation	211
Structure Excavation	212
Rock Excavation	212
Wet Excavation	212
Select Material for Backfilling	613.5.11
Concrete	601
Reinforcing Steel	602

618.7 - METHOD OF MEASUREMENT:

Excluding headwalls and wingwalls, three-sided culverts shall be measured by the linear foot, the measurement being along the centerline of the culvert and extending from the exposed face to exposed face of the headwalls.

Wingwalls shall be measured by the unit. A wingwall is the entire end section for the three-sided structure including but not limited to headwalls, aprons, foundations for the wingwall, cut-off walls and appurtenances.

There shall be no measurement and payment for headwalls. Headwalls shall be incidental to and included in the unit bid price of the wingwalls.

There shall be no separate measurement and payment for the excavation required for installing the culvert, including any undercut to establish an adequate foundation. Excavation, whether unclassified, structure, rock or wet excavation shall be incidental to and included in the unit bid price for the culvert and wingwalls.

There shall be no separate measurement and payment for backfill below an elevation two feet above the top or crown of the outside of the culvert whether such backfill is unclassified borrow, select rock fill, select backfill or salvaged existing streambed material. All such backfill shall be incidental to and included in the unit bid price for the culvert and wingwalls.

Concrete and backfill shall be placed under dry conditions. Should cofferdams, pumping or other methods be necessary to maintain dry conditions, the cost of these methods shall be incidental to and included in the unit bid price for the culvert and wingwalls.

If the maintenance of traffic scheme necessitates the use of sheet piling or bulkheads during the installation of the culvert, the cost of piling and bulkheads shall be incidental to and included in the unit bid price for the culvert and wingwalls.

If the design necessitates undercutting the foundation and backfilling to the footing elevation with select rock fill, the select rock fill shall be separated from soils with fabric for separation per subsection 715.11.8. The cost of the fabric shall be incidental to the unit bid price for the culvert and wingwalls.

The cost of construction layout work shall be incidental to and included in the unit bid price for the culvert and wingwalls.

Additional work arising from changed conditions found during construction from those shown on the approved shop drawings shall be paid in accordance with 109.4.

618.8 - BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract price per unit of measurement, respectively, for each pay item listed below and shown in the bid schedule, which prices and payment will be full compensation for the work prescribed in this section.

618.9 - PAY ITEMS:

ITEM	DESCRIPTION	UNIT
618001-*	PRECAST REINFORCED CONCRETE ARCH-TOPPED CULVERT, "vendor name"	LINEAR FOOT (METER)
618002-*	PRECAST REINFORCED CONCRETE FLAT-TOPPED CULVERT, "vendor name"	LINEAR FOOT (METER)

618003-*	CAST-IN-PLACE REINFORCED CONCRETE CULVERT	LINEAR FOOT (METER)
618004-*	WINGWALL FOR CONCRETE CULVERT	EACH

*Sequence number